

Environmental Impact Assessment Report (EIAR)

Crumhach Wind Farm, Co. Sligo

Chapter 17 - Interaction of the Foregoing



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GLOSSARY OF TERMS

Term	Definition
Interaction of Effects	The combined, indirect, or secondary impacts that arise from the interaction between different environmental factors.

GLOSSARY OF ACRONYMS

Acronym	Definition
BMEP	Biodiversity Management and Enhancement Plan
CEMP	Construction and Environmental Management Plan
DoEHLG	Department of the Environment, Heritage and Local Government
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
FRA	Flood Risk Assessment
GSI	Geological Survey Ireland
KOR	Key Ornithological Receptors
LGV	Light Goods Vehicles
SAC	Special Area of Conservation
VP	Viewpoint
ZTV	Zone of Theoretical Visibility

17. INTERACTION OF EFFECTS

17.1 Introduction

The preceding Chapters 5 to 16 of this EIAR identify the likely significant environmental effects that may occur in terms of Population and Human Health, Biodiversity (Flora and Fauna), Ornithology (Birds), Land, Soils and Geology, Hydrology & Hydrogeology (Water), Air Quality, Climate, Noise and Vibration, Landscape and Visual, Cultural Heritage (Archaeological, Architectural and Cultural Heritage), Material Assets (Roads and Traffic, Telecommunications, Aviation, Utilities and Waste Management), and Vulnerability to/from Major Accidents and Natural Disasters as a result of the Proposed Project, as described in Chapter 4: Description of the Proposed Project of this EIAR. All of the likely significant effects of the Proposed Project and the measures proposed to mitigate them have been outlined in the preceding chapters of this EIAR. Mitigation and best practice measures for the construction, operation and decommissioning of the Proposed Project are detailed in the accompanying draft Construction and Environmental Management Plan (CEMP) (Appendix 4-5). However, for any development with the potential for likely significant environmental effects there is also potential for interaction between these likely significant effects. The result of interactive effects may exacerbate the magnitude of the effects or ameliorate them or have a neutral effect.

A matrix is presented in Table 17-1 below to identify potential interactions between the various aspects of the environment already assessed in this EIAR. The matrix highlights the occurrence of likely positive or negative effects during both the construction (C) and operational (O) phases. It is considered that the potential effects during the decommissioning phase will be similar to the construction phase but of a lesser magnitude. Coloured cells indicate the nature of the interaction between each pair of chapters, with pink representing a negative effect, green highlighting positive and blue shows no interacting effect. In Section 17.2 below, the potential interactions between each environmental component have been discussed in order of the relevant chapters of the EIAR. Once a potential interaction between two environmental components has been discussed, for example, Population & Human Health and Hydrology and Hydrogeology, the interaction will not be discussed again in the following relevant section, therefore there is no Hydrology and Hydrogeology and Population & Human Health section.

Table 17-1 Interaction Matrix: Potential for Interacting Impacts

	Phase	Population and Human Health	Biodiversity	Ornithology	Land, Soils and Geology	Hydrology and Hydrogeology	Air Quality	Climate	Noise and Vibration	Cultural Heritage	Landscape and Visual	Material Assets	Major Accidents & Vulnerability to Natural Disasters
Population and Human Health	C												
	O												
Biodiversity	C												
	O												
Ornithology	C												
	O												
Land, Soils and Geology	C												
	O												
Hydrology and Hydrogeology	C												
	O												
Air Quality	C												
	O												
Climate	C												
	O												
Noise and Vibration	C												
	O												
Cultural Heritage	C												
	O												
Landscape and Visual	C												
	O												
	C												

Material Assets	O												
Major Accidents and Vulnerability to Natural Disasters	C												
	O												

Legend:

No Interacting Effect:		Positive Effect:	
Neutral Effect:		Negative Effect:	
C - Construction Phase		O – Operational Phase	

The potential for interaction of effects has been assessed, throughout this EIAR, as part of the Impact Assessment process. While the work on all parts of the Environmental Impact Assessment Report (EIAR) was not carried out by MKO, the entire project and all the work of the sub-consultants was managed and coordinated by the company. The EIAR was edited and collated by MKO as an integrated report of findings from the impact assessment process, by all relevant experts, and effects that potentially interact have been assessed in detail in the individual chapters of the EIAR and summarised in Section 17.2 below.

Where any potential negative effects have been identified during the assessment process, these impacts have been avoided or reduced by design and the proposed mitigations measures, as presented throughout the EIAR.

17.1.1

Statement of Authority

This section of the EIAR has been completed by Brandon Taylor and Muireann Van Nieuwenhove and reviewed by Ellen Costello, of MKO.

Brandon Taylor is a Project Environmental Scientist with over three years of private consultancy experience. Brandon holds a BSc (Hons) in Geography from McGill University, and a MSc (Hons) in Coastal & Marine Environments from the University of Galway. Brandon's key skills include scientific research and report writing, particularly in the context of local communities and their interactions with environmental stressors, and geospatial analysis and the application of GIS and remote sensing tools across fields of renewable energy development, coastal zone management and education and scientific communication. Since joining MKO, Brandon has been involved in the design and environmental impact assessment of multiple large-scale onshore wind energy developments across Ireland, contributing to and managing the production of EIA reports.

Muireann Van Nieuwenhove is a Graduate Environmental Scientist with MKO. Muireann holds a first-class honours Master's degree (Hons) in Environment, Society and Development from University of Galway and a first class honours Bachelor's degree (Hons) in Geography and French. As part of MKO's environmental renewables team Muireann is involved with the production of EIARs for a variety of wind energy projects. Muireann's areas of expertise include environmental policy, high quality report writing, and geographic information systems.

Ellen Costello is a Senior Environmental Scientist with MKO with over 6 years' experience in private consultancy. Ellen holds a BSc (Hons) in Earth Science, and a MSc (Hons) in Climate Change: Integrated Environmental and Social Science Aspects where she focused her studies on renewable energy development in Europe and its implications on environment and society. Ellen's key strengths and expertise are Environmental Protection and Management, Environmental Impact Statements, Project Management, and GIS Mapping and Modelling. Since joining MKO, Ellen has been involved in a range of renewable energy infrastructure projects. In her role as a senior project manager, Ellen works with and co-ordinates large multidisciplinary teams including members from MKO's Environmental, Planning, Ecological and Ornithological departments as well as sub-contractors from various fields in the preparation and production of EIARs.

This report has also been reviewed by Sean Creedon (B.Sc., M.Sc.). Sean has 23 years' experience in planning and environmental impact elements within all stages of wind farm project delivery.

17.2 Impact Interactions

17.2.1 Population and Human Health

Population and Human Health and Land, Soils & Geology

The use of plant machinery on site during excavation works and the movement of peat and spoil may result in the potential for soil and ground contamination. A wind farm and associated grid infrastructure is not a recognised source of pollution and so the potential for effects during the operational phase are imperceptible. With the implementation of mitigation and monitoring measures detailed in Section 8.7.2, Section 8.7.3 and Section 8.7.4 of Chapter 8: Land, Soils & Geology and the CEMP (Appendix 4-5), the potential for residual effects associated with soil or ground contamination during the construction and operational phases and subsequent health effects are long-term, imperceptible and negative.

On this basis, the identified interaction is Not Significant.

Population and Human Health and Hydrology and Hydrogeology

Potential health effects arise mainly through the potential for surface and groundwater contamination which may have negative effects on public and private water supplies, see Section 5.10.2.2.4 of Chapter 5: Population & Human Health.

There are no underground water or sewerage networks at Proposed Wind Farm infrastructure locations. Easky Lough is the only public water supply surface water abstraction point near the Proposed Wind Farm located approximately 1.9km south of the Site. A search of private well locations on Geological Survey Ireland (GSI) well database (www.gsi.ie) reveal several wells in the surrounding lands at the Proposed Wind Farm, in Chapter 9 of this EIAR. There are no wells with a locational accuracy of ≤50m mapped by the GSI within 1km of the Proposed Wind Farm.

In the area of the Proposed Wind Farm, private dwelling houses (potential well locations) are mainly located along public roads to the north of the Proposed Wind Farm. The biggest risk to potential down-gradient wells will be from where deeper excavations are required such as the turbine bases and borrow pits. Due to the nature of the Proposed Grid Connection Route underground cable being mainly within the carriageway of public roads outside the Proposed Wind Farm and the shallow nature of the works, no assessment on potential wells located along the cable route (public road or private land sections) was carried out due to the lack of potential effects. See Section 9.3.14.2 of Chapter 9: Hydrology and Hydrogeology for further detail.

The closest distance between a proposed turbine or borrow pit location and a downstream dwelling house (potential well) is >760m. Following the precautionary principle, it is assumed that all dwellings in the surrounding lands have private groundwater wells. However, due to the relatively shallow nature of the deepest excavations (13-17m), the hydrogeological regime and the >760m setback distance from potential wells, significant effects on private wells are unlikely. See section 9.5.2.10 of Chapter 9: Hydrology and Hydrogeology.

The Proposed Project design and mitigation measures detailed in Chapter 9: Hydrology and Hydrogeology and the CEMP (Appendix 4-5) ensures that the potential for effects on the water environment are not significant. A comprehensive suite of surface water mitigation measures and controls are outlined in Chapter 9: Hydrology and Hydrogeology to ensure protection of all downstream receiving surface waters. Mitigation measures will ensure that surface runoff from the Site will be of a high quality and will therefore not impact on the quality of downstream surface water bodies, group water schemes, or wells there will be no likely significant effects on human health.

On this basis, the identified interaction is Not Significant.

Population and Human Health, and Air Quality

The excavation and movement of peat and spoil during the construction phase of the Proposed Project is likely to create dust and result in the emission of air pollutants from construction and excavation machinery which will result in a short-term, slight, negative effect on local air quality. Mitigation measures to reduce dust and exhaust emissions generated during the construction phase of the Proposed Project are presented in Chapter 10: Air Quality.

During the operational phase, the Proposed Project will generate additional traffic to the area in the form of light goods vehicles (LGVs) visiting the Site 1-2 times per day for inspections and maintenance, giving rise to a long-term imperceptible negative impact on air quality. However, wind turbines are not a recognised source of pollution and will instead be providing clean energy into the National Grid. This will have a long-term moderate positive effect on human health.

By providing an alternative to electricity derived from coal, oil or gas-fired power stations during the operational phase, the Proposed Project will result in emission savings of carbon dioxide (CO₂), oxides of nitrogen (NO_x), and sulphur dioxide (SO₂). The production of renewable energy from the Proposed Project will have a long-term, moderate, positive impact on air quality.

On this basis, the identified interaction is Not Significant.

Population and Human Health, and Climate

The construction of the Proposed Project will have a long-term, imperceptible, negative effect on climate and will be restricted to the duration of the construction phase. However, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible negative effect on Climate and therefore population and human health.

The Proposed Project when in operation, will reduce the input of carbon intensive energy into the national grid and reduce the amount of greenhouse gas emissions being released to the atmosphere. Harnessing more energy by means of renewable sources will reduce dependency on fossil fuels, thereby resulting in a reduction in harmful emissions that can be damaging to human health and the environment.

For the purposes of this EIAR it is assumed that the wind turbine model installed as part of the Proposed Project will have an output of 6MW. Therefore, on this basis, the 17 no. Proposed Turbines would have a combined generating capacity of 102 MW displacing approximately 55,760 tonnes of carbon emissions per annum from the largely carbon-based traditional energy mix, the detail of which is presented in Chapter 11: Climate. This will have a long-term moderate positive effect on climate and therefore a long-term moderate positive effect on health.

On this basis, there identified interaction is Not Significant.

Population and Human Health and Noise and Vibration

As identified in Chapter 5: Population & Human Health of this EIAR, the construction phase will generate an increase in noise levels in the vicinity of the Site which has the potential to impact sensitive receptors in the area. The contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise* and all mitigation measures, as detail in Chapter 12: Noise & Vibration and the CEMP, will be implemented. The construction phase will likely create a short-term slight to moderate negative effect on human health caused by construction plant and vehicle noise emissions.

As detailed in Chapter 12: Noise & Vibration, the predicted noise emissions during the operational phase, once the appropriate mitigation measures are implemented, will be long-term negative and not significant. Furthermore, as noise emissions from turbines are controllable via inbuilt technologies, the Proposed Project will be able to comply with the Guidelines (DoEHLG, 2006) and future iterations should they come into effect before a decision is made on this application. Likewise, the Proposed Turbines will be capable of achieving compliance with noise conditions imposed should the Proposed Project receive a grant of planning permission.

On this basis, the identified interaction is Not Significant.

Population and Human Health, and Landscape and Visual

The construction phase of the Proposed Project will see the temporary introduction of construction machinery and the erection of wind turbines into a natural but already modified landscape. The erection of the Proposed Turbines in particular will change the existing landscape.

Chapter 13: Landscape and Visual of this EIAR comprises the landscape and visual impact assessment of the Proposed Project. As detailed in Chapter 13, it is to be anticipated that wind farms inevitably cause 'Significant' visual effects on proximate sensitive visual receptors due to the prominence of turbines within landscape views and the 'Substantial' magnitude of change which will arise in close proximity to a wind farm development. As is reported throughout Chapter 13, the Zone of Theoretical Visibility (ZTV) shows limited visual exposure, and in general, sparsely settled upland landscapes are of a scale that can absorb wind energy development. Also, due to the siting of turbines on elevated lands in this landscape, there is potential for turbines to appear overbearing or domineering when they are sited in close proximity to residential receptors and there is an absence of visual screening.

VP05, VP07, VP14, and VP15, are rated of relatively high significance ('Moderate'). VP01, VP02, VP06, VP10, VP11, VP12, and VP13 are rated 'Slight' or 'Negligible' and are therefore deemed 'Not Significant'. VP03, VP04, VP08 and VP09 are rated 'Slight' on both the Magnitude of Visual Change and Significance of Residual Visual Effect. VP14 and VP15, are both located within 1.5km from the Proposed Wind Farm and are representative viewpoints for assessment of local residential visual amenity. Please see Section 13.7.4 of Chapter 13 (Landscape and Visual) and Volume 2: Photomontage Booklet for further detail on these viewpoints.

The no. of receptors in this area is low, as the population density of the Population Study Area recorded during the 2022 Census is 8.8 persons per square kilometre, which is considerably lower than the national population densities of 73.3 persons per square kilometre (km²), and lower than the population density of County Sligo, recorded at 38.2 persons per km² respectively.

On this basis of the effects of the Proposed Wind Farm on residential visual amenity as outlined above and the overall remoteness of the Site and low number of sensitive receptors within the Population Study Area, the identified interaction is considered to be Not Significant.

Population, and Human Health and Material Assets

During the construction phase the Proposed Project will give rise to traffic movements of abnormal loads and increased traffic volumes on the local road network and, therefore, is likely to create some short-term inconvenience for other road users as well as dust and exhaust emissions. A Traffic Management Plan will be implemented prior to construction to minimise all disruption, as described in Chapter 15: Material Assets and the CEMP (Appendix 4-5).

During the operational phase, impacts on the surrounding local highway network will be imperceptible. With the implementation of measures detailed in Chapter 5: Population & Human Health and the CEMP (Appendix 4-5) dust and exhaust emission will be contained and the potential for impact on health will be imperceptible.

As detailed in Chapter 15: Material Assets, the Proposed Project will have a no impacts on telecommunications and aviation assets or operations and a short-term, slight, negative effect on utilities during the construction phase.

During the operational phase, there will be no impacts or associated effects on built services or telecommunications associated with the Proposed Project. The Proposed Project will have a long-term imperceptible neutral residual effect on aviation assets during the operational phase.

The Proposed Project has the potential to supply 102MW of electricity to the national grid during the operational phase, offsetting the use of fossil fuels within the electricity sector. This has a long-term moderate positive effect on national electricity supply and the offsetting of fossil fuel consumption, thereby resulting in a reduction in harmful emissions that can be damaging to human health.

On this basis, the identified interaction is Not Significant.

17.2.2 Biodiversity

Biodiversity and Ornithology

Site activities during the construction phase of the Proposed Project may have the potential to give rise to disturbance and deterioration of habitat to birds and their prey species. An overview of survey data is included in Section 7.3.7 of Chapter 7: Ornithology with detailed maps provided in Appendix 7-4 Survey Data. Survey Data and maps relating to roost sites are provided in Confidential Appendix 7-5.

Potential impacts on Key Ornithological Receptors (KORs) are included in Section 7.5 of Chapter 7: Ornithology. A range of mitigation measures will be put in place to ensure that there will be no significant negative effects on any habitats or flora and fauna, these are contained within the Biodiversity Management and Enhancement Plan (BMEP), provided as Appendix 6-4. Enhancing existing peatland habitats within the site which link up existing peatland habitats of the Ox Mountains Bogs Special Area of Conservation (SAC), thereby improving habitat connectivity and offsetting the loss of blanket bog and cutover bog habitat for the Proposed Project and to restore habitat condition of degraded peatland habitats to favourable conservation status for upland blanket bog.

Following the measures described in Section 7.6 of Chapter 7, no effect significance greater than likely long-term slight negative effect, as per EPA (2022) criteria, was identified for any KOR. Taking into consideration the effect significance levels identified and the proposed best practice and mitigation, significant residual effects on the KORs with regard to direct habitat loss, disturbance/displacement or collision mortality are not anticipated.

On this basis, the identified interaction is Not Significant.

Biodiversity and Land, Soils & Geology

The removal of forestry and the excavation of peat and spoil during the construction phase of the Proposed Project is likely to result in the disturbance of flora and fauna in and adjacent to the Proposed Project footprint thereby, potentially causing a long term, slight, negative effect on flora and fauna. These potential impacts have been assessed in Chapter 6: Biodiversity of this EIAR, and excavated peat and spoil will be contained on site in the designated peat and spoil management areas or used for landscaping (Appendix 4-2 contains the Peat and Spoil Management Plan).

It is proposed to enhance and manage an array of habitats such as Peatland and Blanket Bog habitats within the Proposed Wind Farm. The aforementioned are discussed in detail in Appendix 6-4 (BMEP).

Due to the largely non-invasive nature of the BMEP works, the potential for effects on the soils and geological environment are limited. The works will have a positive, slight, direct, permanent effect on the land environment. Please see Chapter 6: Biodiversity and Appendix 6-4 BMEP for details.

On this basis, the identified interaction is Not Significant.

Biodiversity and Hydrology and Hydrogeology

Site activities during the construction phase of the Proposed Project may have the potential to give rise to water pollution, and consequential indirect effects (such as disturbance and deterioration of habitat quality) on flora and fauna that use that water within the same catchment. These potential impacts have been assessed in Chapter 6: Biodiversity and Chapter 9: Hydrology and Hydrogeology and the relevant mitigation measures outlined in these chapters; the Surface Water Management Plan (Appendix 4-4) and the CEMP (Appendix 4-5) will be in place to avoid any water pollution and subsequent effect on flora and fauna.

As part of the Proposed Project; enhancement measures include peatland enhancement and restoration, grazing management, and restoration of peat and spoil management areas. These measures will have a positive effect on the local hydrological regime, providing water attenuation and slowing the release of surface water from the Proposed Wind Farm as a result of drain blocking. Following the implementation of the BMEP, there is potential for a positive, moderate, and permanent effect on the local peat bog hydrology/hydrogeology.

On this basis, the identified interaction is Not Significant.

Biodiversity and Air Quality

During the construction phase of the Proposed Project, increased vehicular and dust emissions within and around the Site have the potential to be a nuisance to flora and fauna, thereby having a short-term, slight, negative effect. The mitigation measures outlined in Chapter 10: Air Quality and the CEMP (Appendix 4-5) of the EIAR will ensure that the potential for negative effects is reduced or eliminated.

During the operational phase, the potential for effects on biodiversity from vehicular and dust emissions are imperceptible, however the overall displacement of fossil fuel emissions resulting from the operation of the Proposed Project will have a long-term moderate positive effect on air quality for biodiversity.

On this basis, the identified interaction is Not Significant.

Biodiversity and Climate

The construction of the Proposed Project will result in greenhouse gas emissions associated with tree felling, production of Proposed Project infrastructure and construction materials, and operation of vehicles and plant. As well, the Proposed Project footprint will result in the loss of carbon fixing vegetation within the Proposed Wind Farm, however that has been avoided where possible by the design and layout of the Proposed Project.

During the construction phase, there will be a short-term, negative and slight effect on climate, and therefore on biodiversity, given the quantity of greenhouse gases that will be emitted to the atmosphere and will be restricted to the duration of the construction phase. However, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible, negative effect on the climate and therefore biodiversity. This is assessed further in Chapter 11: Climate of this EIAR, and mitigation measures are presented to minimise any potential effects. The carbon storage capacity of restored peatland habitats will vary over time as water levels are raised, vegetation matures, and the baseline environment changes. Therefore, while it can be assumed that measures outlined in the BMEP (Appendix 6-4) will result in an increased capacity of

carbon storage, to ensure the carbon assessment contained in Section 11.4 of Chapter 11: Climate is completed under a theoretical precautionary scenario the quantification of these potential carbon savings associated with these measures has not been assessed.

Some potential long-term slight negative impacts that may occur during the operational phase of the Proposed Wind Farm are the release of carbon dioxide to the atmosphere due to maintenance and monitoring activities, including the removal of carbon fixing vegetation and habitat, as well as peat reinstatement and associated drainage. However, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year operational lifespan due to the provision of clean renewable energy to the national grid, consequently, in combination with other renewable energy projects, the Proposed Project will have a long term, moderate positive effect on climate and therefore an indirect positive effect on biodiversity.

On this basis, the identified interaction is Not Significant.

Biodiversity and Noise & Vibration

Site activity during the construction phase could give rise to noise that could cause disturbance to fauna, which use the Site. Best practice mitigation measures are included in Chapter 6: Biodiversity and Chapter 12: Noise & Vibration and the CEMP (Appendix 4-5) to minimise the potential negative effect of noise generated during the construction phase on biodiversity.

The limited onsite noise activity generated by the Proposed Project during the operational phase will have an imperceptible effect on biodiversity.

On this basis, the identified interaction is Not Significant.

17.2.3 Ornithology

Ornithology and Land, Soils & Geology

The removal of peat and soil during construction phase of the Proposed Project is likely to result in some disturbance of flora and fauna, including birds, in the areas surrounding the Proposed Project works area. During the construction phase, there will be a short-term to long-term, slight, negative effect on birds due to disturbance and relocation within the Site. The relevant mitigation measures outlined in Chapter 7: Ornithology, Chapter 8: Lands, Soils & Geology and the CEMP (Appendix 4-5) will be in place to avoid any potential significant effect on birds.

On this basis, the identified interaction is Not Significant.

Ornithology and Hydrology and Hydrogeology

Site activities during the construction phase of the Proposed Project may have the potential to give rise to some water pollution, and consequential short-term negative indirect effects on birds and their prey species (such as disturbance and deterioration of habitat quality) that use that water within the same catchment. With the implementation of mitigation and monitoring measures outlined in Chapter 7: Ornithology, Chapter 9: Hydrology and Hydrogeology and the CEMP (Appendix 4-5), there will be no significant residual effect on aquatic habitats or species as a result of the Proposed Project.

On this basis, the identified interaction is Not Significant.

Ornithology and Air Quality

During the construction phase of the Proposed Project, increased vehicular and dust emissions within and around the Site have the potential to cause disturbance to birds, thereby having a short-term, slight, negative effect. The mitigation measures outlined in Chapter 10: Air Quality and the CEMP (Appendix 4-5) of the EIAR will ensure that the potential for negative effects is reduced or eliminated.

During the operational phase, the potential for effects on birds from vehicular and dust emissions are imperceptible, however the overall displacement of fossil fuel emissions resulting from the operation of the Proposed Project will have a long-term moderate positive effect on air quality for biodiversity.

On this basis, the identified interaction is Not Significant.

Ornithology and Climate

The construction of the Proposed Project will result in greenhouse gas emissions associated with tree felling, production of Proposed Project infrastructure and construction materials, and operation of vehicles and plant. As well, the Proposed Project footprint will result in the loss of carbon fixing vegetation within the Proposed Wind Farm. This impact on birds ranges from a negative slight to imperceptible effect, given the quantity of greenhouse gases that will be emitted to the atmosphere and will be restricted to the duration of the construction phase. As discussed above in Section 17.2.1, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible negative effect on Climate.

During the operational phase, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year operational lifespan due to the provision of clean renewable energy to the national grid, consequently, in combination with other renewable energy projects, the Proposed Project will have a long term, moderate positive effect on flora and fauna, including KORs.

On this basis, the identified interaction is Not Significant.

Ornithology and Noise & Vibration

Site activity during the construction phase could give rise to noise that could cause disturbance to birds, which use the Site. Best practice mitigation measures are included in Chapter 7: Ornithology and Chapter 12: Noise & Vibration and the CEMP (Appendix 4-5) to minimise the potential negative effect of noise generated during the construction phase.

The limited onsite noise activity generated by the Proposed Project during the operational phase will have an imperceptible effect on birds.

On this basis, the identified interaction is Not Significant.

17.2.4 Land, Soils and Geology

Land, Soils & Geology, and Hydrology and Hydrogeology

As identified in Chapter 9: Hydrology and Hydrogeology, 29.1 ha of conifer plantation will be felled to accommodate the Proposed Project. This has the potential to have indirect, negative, temporary, likely effect on surface water. Mitigation measures within Chapter 9, Appendix 4-4 Surface Water Management Plan and Appendix 4-5 CEMP include proven forestry best practice measures to mitigate the risk of releases of sediment which have been proposed to ensure that the deforestation activities have no potential impact on the status, ecology or hydro morphology of downstream waters. The

residual effect of the Proposed Wind Farm will be negative, imperceptible, indirect, temporary, likely effect on downstream water quality and aquatic habitats.

On this basis, the identified interaction is Not Significant.

Land, Soils & Geology and Air Quality

The excavation works and transportation of vehicles to/from and around the Site will give rise to dust, which is considered a short-term, slight, negative impact on air quality. Mitigation measures outlined in Chapter 10: Air Quality will reduce the potential for negative effects on land, soils, and geology, including includes dust suppression measures which is further outlined in the CEMP (Appendix 4-5).

On this basis, the identified interaction is Not Significant.

Land, Soils & Geology and Climate

The construction of the Proposed Project will result in greenhouse gas emissions associated with production of construction materials and operation of vehicles and plant. This impact will be negative and slight only, given the quantity of greenhouse gases that will be emitted to the atmosphere and will be restricted to the duration of the construction phase. Some potential long-term imperceptible negative effects will occur due to the removal of carbon fixing vegetation and habitat, however, that has been avoided where possible by the design and layout of the Proposed Wind Farm, which has ensured the utilisation of as much of the existing access tracks within the Site as possible to gain access to the proposed turbine locations and minimise the construction of additional tracks. This effect will be long-term, negative and imperceptible, given the quantity of greenhouse gases that will be emitted to the atmosphere and is not significant.

As discussed above in Section 17.2.1, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible negative effect on Climate.

Land, Soils & Geology and Landscape & Visual

The removal of spoil and the subsequent replacement with crushed stone for the construction of the site roads and hardstanding areas within the Proposed Wind Farm has the potential to alter the local landscape. The visual effect of this change is expected to be long-term, negative and slight.

On this basis, the identified interaction is Not Significant.

Land, Soils & Geology and Cultural Heritage

The construction of the Proposed Project will not result in any direct, negative effects on the recorded archaeological, architectural or cultural heritage resource as none of these sites are located within the footprint of the development that require excavations and ground works. However, it is possible that previously unrecorded sub-surface archaeological finds, features or deposits are located within the Proposed Wind Farm site in areas which have not undergone previous ground disturbance, and in particular areas of in situ peat. The excavation of topsoil /peat for the turbine bases, hardstands and associated infrastructure (roads, cable route, borrow pits etc.) may affect any sub-surface archaeological finds, features or deposits, if present. Mitigation measures outlined in Chapter 14: Cultural Heritage will reduce the potential for negative effects on unrecorded sites and artefacts during excavations.

During the operational phase, there is no potential for impacts on cultural heritage from a land soils and geology perspective as there will be no groundworks ae excavations associated with this phase.

On this basis, the identified interaction is Not Significant.

17.2.5 Air Quality

Air Quality and Material Assets

The transportation of vehicles to/from and around the Proposed Project will give rise to dust emissions which is considered a short-term, slight, negative impact on air quality. Following implementation of mitigation measures as outlined in Chapter 10: Air Quality, Chapter 15: Material Assets and the CEMP (Appendix 4-5) there will be a short-term, imperceptible, negative effect on air quality due to transportation movements. Dust and exhaust emissions generated through the transportation of vehicles to/from and around the Site during the operational phase (1-2 LGVs per day) are imperceptible.

On this basis, the identified interaction is Not Significant.

17.2.6 Climate

Climate and Material Assets

The construction of the Proposed Project will result in greenhouse gas emissions associated with peat disturbance and removal, tree felling, production of Proposed Project infrastructure and construction materials, and operation of vehicles and plant. As well, the Proposed Project footprint will result in the loss of carbon fixing vegetation and peat within the Proposed Wind Farm. This negative impact will be imperceptible, given the quantity of greenhouse gases that will be emitted to the atmosphere and will be restricted to the duration of the construction phase. However, once emitted to the atmosphere, the greenhouse gas emissions that will arise from construction phase activities will have a permanent imperceptible negative effect on Climate and therefore material assets. This is assessed further in Chapter 11: Climate of this EIAR, and mitigation measures are presented to minimise any potential effects.

During the operational phase, the Proposed Project will displace carbon dioxide from fossil fuel-based electricity generation, over the proposed 35-year lifespan of the Proposed Project. Therefore, while there will be greenhouse gas emissions associated with the operation of the Proposed Project, this will be offset by the operation of the Proposed Project which will offset 55,760 tonnes of carbon dioxide per annum or 1,951,600 tonnes over its operational life from traditional carbon-based electricity generation. Subsequently, this will cause a long-term moderate positive effect on Climate as a result of reduced greenhouse gas emissions.

On this basis, the identified interaction is not significant.

17.2.7 Landscape and Visual

Landscape & Visual and Cultural Heritage

As described in Chapter 13: Landscape & Visual of this EIAR, the Proposed Turbines have the potential to change the landscape setting of recorded sites and monuments in the wider area. The Proposed Turbines will be visible to one site of local cultural heritage, Cooper's Lodge. The site is not a recorded national monument and is not considered a popular tourist destination and is relatively unknown except to locals. It is anticipated that the Proposed Turbines will cause "Significant" negative visual effects on Cooper's Lodge. However, it is concluded in Chapter 13 that any potential, indirect, negative visual effect of the Proposed Turbines on recorded national monuments and sites range from imperceptible to moderate. In reality the effect will be less severe due to natural screening, boundaries, buildings and vegetation, which will alleviate if not remove the impact on setting altogether.

Furthermore, some monuments may not be readily visible in the landscape which further ameliorates potential effects on setting.

On this basis, the identified interaction is Not Significant.

17.2.8 Vulnerability to Natural Disasters

As described in Chapter 16: Major Accidents and Natural Disasters, major accidents or natural disasters are hazards which have the potential to affect the Proposed Project and lead to environmental effects both directly and indirectly. These include accidents during construction, operation and decommissioning of the Proposed Project caused by operational failure and/or natural hazards. The assessment of the potential for significant accidents or disasters is conducted in connection with the information that must be included in the EIAR. This includes aspects such as population and human health, biodiversity, land and soil, water, air quality, climate, material assets, cultural heritage, and the landscape. The risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low' in accordance with the '*Guide to Risk Assessment in Major Emergency Management*' (DoEHLG, 2010).

When the above mitigation is implemented, and all mitigation detailed in the EIAR is implemented, the residual effect(s) associated with the construction, operation and decommissioning of the Proposed Project are not significant.

17.3 Mitigation and Residual Effects

Where any potential interactive negative effects have been identified in the above, a full suite of appropriate mitigation measures have already been included in the relevant sections (Chapters 5 – 16) of the EIAR and are detailed in the CEMP (Appendix 4-5). The implementation of these mitigation measures will reduce or remove the potential for likely significant negative effects. Information on potential residual effects and the significance of effects, is also presented in each relevant chapter. On this basis the effects arising from the identified interactions are not significant.